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QUDA Programming for Staggered Quarks

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We have been extending the QUDA GPU code developed at Boston University to include the case of improved staggered quarks. Improved staggered quarks such as asqtad and HISQ require both first and third nearest neighbor terms in the Dirac operator. We call the corresponding links fatlinks and longlinks. The fatlinks are not unitary and staggered phases are included in the links, so link reconstruction techniques may either be inapplicable or require modification. A single precision inverter using compressed storage for the longlinks achieves a speed of 100 GF/s on an NVIDIA GTX280 GPU on a $24^3 \times 32$ lattice.

In addition to the inverter code, we have code for fatlink computation, gauge force and fermion force. They run at 170, 186 and 107 GF/s, respectively, for similar conditions to the solver speed above.

The single GPU code is currently in production on NCSA's AC cluster for the study of electromagnetic effects. The double precision multimass solver is running at 20 GF/s, about 80\% of the speed of an 8-node or 64-core job on Fermilab's jpsi cluster. The AC cluster has C1060 Tesla boards with lower memory bandwidth than the GTX280, where the DP inverter runs at 33 GF/s. Multi-GPU code is in development.

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talk

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